V.—*On the Bats of the* Hipposiderus armiger *and* Commersoni *Types.* By Knud Andersen.

I.—The *Hipposiderus armiger* Type.

Nasals not inflated, the naso-frontal region of the skull forming an almost completely flattened pentagonal area. This is the chief peculiarity of the skull as compared with the *diadema* type. A facial foramen (for the nerve-supply of the nose-leaves), situated at about the middle of the naso-frontal region, leading into two fine canals, the one extending backwards, the other forwards, into the bone; rarely (in 3 out of 37 skulls) the canals open by two separate foramina, the one in front of the other *. The infraorbital foramina slightly wider (not longer) than in *H. diadema*.

Dentition essentially as in *H. diadema*, but a trifle more advanced :—p_2 and p_1 always in contact, and the cingula almost always overlapping each other. p^2 very small, external to the tooth-row; the canine and p^1 as a rule but very slightly separated or completely in contact †. The chief progress, as compared with *diadema* ‡, is the more strongly pronounced reduction, or very often complete disappearance, of the interspace between c and p^4 (the former place of p^2).

The wing structure differs in some details from that of *diadema* and its closest allies § :—whereas the fifth metacarpal has retained precisely the same length (in proportion to the forearm) as in *diadema*, the fourth is somewhat, the third considerably, shortened, making as a total result the third and fourth equal in length and but slightly longer than the fifth (individually, of course, the fourth metacarpal is found sometimes a little shorter, sometimes, especially in *H. turpis*, a trifle longer, than the third). The proportionate length of the phalanges is almost as in *diadema*.

Posterior leaf narrower than the horseshoe, trilobate; three vertical ridges on the front face of the leaf. No notch in the front border of the horseshoe ‖. In one species

* A similar foramen is found in the bats of the *H. diadema* type.

† The details, from an examination of thirty-seven skulls, are these :—in three c and p^1 are distinctly, but rather narrowly, separated; in sixteen slightly or very slightly separated; in eighteen in contact, and in three of these the cingula overlap each other.

‡ Ann. & Mag. Nat. Hist. (7) xvi. p. 504 (Nov. 1905).

§ Compare the wing-indices below, on p. 48.

‖ A notch in the front border of the horseshoe is found in *H. Pratti*, a species which bears some external resemblance to *H. armiger*. But the skull of *H. Pratti* is very peculiar (sagittal crest raising abruptly far

(*H. turpis*) three supplementary leaflets external to the horseshoe, in another (*H. armiger*) four, the fourth very small (or, in very rare instances, completely wanting). Wart-like elevations, forming a backward extending direct continuation of the third supplementary leaflet, greatly developed in adult males, smaller in females. Frontal sac in adult males very large, opening transversal; in females small or represented by a depression only.

Males of the *armiger* type *average* somewhat larger than females, but practically there is no fixed difference in size between the sexes, small males being often inferior in size to large females.

Colour.—Upperside, from shoulder-region to tail ("horseshoe-patch"), almost "Vandyke brown," this colour confined to the narrow tips of the hairs; broad base of hairs "wood-brown"; upperside of head, neck, and front of back, owing to a considerable reduction or complete absence of the dark hair-tips, "wood-brown," contrasting with the rest of the back; line of demarcation between these light- and dark-coloured regions of the upperside strongly marked, crescent-shaped, concavity forwards. The whole of the underside a very dark shade of "wood-brown."—Individual variation small: the "horseshoe-patch" can be darker, approaching "seal-brown," and at the same time the "wood-brown" lighter; this is the case especially in young adults. The sexes are alike in colour, nor is there any appreciable colour-difference between the species or subspecies.

Range.—Throughout the Himalayas, eastwards to the Loo-choo Islands, southwards to the Malay Peninsula.

1. *Hipposiderus armiger*, Hodgs.

Diagnosis.—Forearm about 87·5–97 mm.

Four supplementary leaflets, the fourth very small and occasionally (in 1 out of 26 specimens examined) completely wanting. [Skins of this species, in which the nose-leaves are damaged or made unrecognizable by shrinkage, are puzzlingly like *H. diadema* or *H. lankadiva*; the very different naso-frontal region of the skull will make them easily distinguishable; in case also the skull is unavailable for examination, *H. armiger* can always be discriminated by the *longer*

---

beyond the level of the very broad facial region of the skull, almost to the same degree as in *Rhinonycteris*!), showing it to have no very close relationship with the *armiger* type. I believe it to be a relative of *H. leptophylla*, the skull of which is as yet unknown.

lower leg : in *diadema* 30–37 mm., in *lankadiva* 35·5–37·5, in *armiger*, although the bat is practically of the same size as the latter species, 38–43. There is, as pointed out above, also some difference in the wing-structure.—From *H. Pratti*, under alike unfavourable conditions, *H. armiger* can be discriminated by the much smaller hind foot : in *armiger* (measured with claws) 15·8–19 mm., in *Pratti*, although this species averages slightly smaller, 21–22·5, as well as by the markedly longer lower leg, *Pratti* agreeing in this point with *diadema*.]

Range.—From Masuri eastwards to Fokien, southwards to the Malay Peninsula.

1 *a*. *H. armiger debilis*, subsp. n.

"*Hipposiderus Diadema*, Gray?," Cantor (non Geoffr.), J. A. S. B. xv. no. 171, p. 181 (1846).

Diagnosis *.—Anteorbital width 9–10 mm. Mandibular tooth-row, exclusive of incisors, 13–14.

Type.—♂ ad. (skin). Prov. Wellesley, Malay Peninsula. Dr. Th. Cantor's Collection. Brit. Mus. no. 79. 11. 21. 80.

Range.—Malay Peninsula, northwards to Assam (Khasia Hills).

1 *b*. *H. armiger*, Hodgs., *typicus*.

Rhinolphus (sic) *armiger*, Hodgson, J. A. S. B. iv. no. 48, p. 699 (Dec. 1835).

Phyllorhina Swinhoii, Peters, P. Z. S. 1870, p. 616.

Diagnosis †.—Anteorbital width 9·7–10·7 mm. Mandibular tooth-row, exclusive of incisors, 13·7–14·5.

Range.—From Masuri eastwards through Upper Burmah, to Szechuen and Fokien.

Technical name.—The type locality is "the central region of Nepal." The typical specimens of Hodgson's *Rh. armiger* (♂ ad., ♀ ad., in alcohol) are in the British Museum.

Ph. Swinhoei.—Type locality : Amoy, Fokien. Three cotypes (skins ; Amoy, 1867 ; R. Swinhoe ded. ; Peters det.) are in the British Museum. These and other examples from Fokien are indistinguishable from Nepal individuals. Peters's

* 10 specimens examined :—9 (skins), various places in the Malay Peninsula ; 1 (in alc.), Khasia Hills, Assam. Skulls of all the specimens.

† 16 specimens examined :—2 (alc.), Masuri ; 5 (alc. and skins), Nepal ; 1 (alc.), Kakhyen Hills, Upper Burmah ; 1 (alc.), Kia-ting-fu, W. Szechuen ; 6 (skins), various places in the province of Fokien, S. China ; 1 (skin), stated to be from N. China. 11 skulls, representing all the localities enumerated.

remarks on *H. Swinhoei* make me suppose that he regarded it as an unrecorded species, because he compared it not with *H. armiger*, but with *H. diadema*.

Remarks.—There is only an *average* difference between the southern and n rthern race of *H. armiger*. In the latter the skull, more especially the facial region, is generally a little heavier built, the tooth-rows a trifle longer. The external difference is still less pronounced. The two races, perhaps, meet somewhere in Burmah or Assam.

2. *Hipposiderus turpis*, Bangs.

Hipposiderus turpis, Outram Bangs, Amer. Naturalist, xxxv. no. 415, p. 561 (July 1901).

Diagnosis *.—Forearm about 67·2–71·7 mm.

The skull is an exact miniature copy of an *armiger* skull. So far as I can make out from dried specimens (by re-softening the nose-leaves), there are three leaflets only, without any trace of a fourth. The fourth metacarpal is, more often than in *armiger*, a trifle longer than the third. These are, I believe, the only external differences as compared with *armiger*, apart from the much smaller size.

Range.—As yet recorded only from Ishigaki, S. Loo-choo Islands.

II.—The *Hipposiderus Commersoni* Type.

The general shape of the skull much as in the *diadema* type. Nasal swellings distinctly inflated, as in *diadema* (not flattened, as in *armiger*). Naso-frontal region broader, especially posteriorly, and more pronouncedly pentagonal in shape, both of these peculiarities chiefly due to the somewhat more projecting postorbital processes (in *diadema* and its allies the postorbital processes are smaller and more rounded off). A small facial foramen, situated in the middle line between the posterior nasal swellings. Sagittal crest more strongly, sometimes (viz. in *H. gigas*) enormously, developed, crescent-shaped, gradually descending in front towards, and merging into, the supraorbital ridges. Lambdoid crest stronger than in *diadema*. The rami of the mandible higher. There is scarcely any other essential and constant difference between the skulls of the *diadema* and *Commersoni* types.

* 13 skins, with skulls, examined.—For the loan of 9 of these specimens I am indebted to the Authorities of the Museum of Comparative Zoology, Cambridge, Massachusetts.

Dentition much as in *diadema*, but slightly more advanced:—the cingula of p_2 and p_4 generally overlapping each other, often very strongly so, rarely in simple contact without overlapping; in none of the twelve skulls examined, representing all the forms known, is there any interspace between p_2 and p_4. p^2 always external to the tooth-row, often unusually small; the upper canine and p^4 in contact, sometimes slightly overlapping each other at base, rarely separated. *A small, but always very distinct, cusp-like projection on the hinder cutting-edge of the upper canines*, a little above the middle of the tooth (no trace of a similar "cusp" in *diadema* nor in *armiger*); front face of upper canines more or less distinctly furrowed, in *H. gigas* very deeply so (practically smooth in *diadema* and *armiger*).

Wing-structure* on a considerably higher level of development than in *diadema* and its allies:—third and fourth metacarpals slightly shortened, *fifth lengthened*, making as a final result the third metacarpal a little longer than the fourth, but the fourth and fifth practically equal in length (individually the fifth metacarpal can be even a trifle longer than the fourth); broadly speaking, these three metacarpals might be called *approximately* equal in length (in *diadema* the fifth decidedly much shorter than the fourth and third). *Distal phalanx of the third finger much lengthened* (much longer than the proximal phalanx; in *diadema* only about equal to, or shorter than, the proximal phalanx). These modifications combined make a broader and, especially, more pointed wing, *i. e.* an increased power of flight.

The nose-leaves are, in their more essential characters, of the *diadema* type. Four supplementary leaflets on either side, external to the horseshoe, the fourth always the smallest, but very rarely (*H. gigas gambiensis*) completely wanting; I never found *more* than four leaflets†. The

* Compare the wing-indices below, on p. 48.

† The statements in literature about the number of supplementary leaflets in these bats are very confusing:—two (Temminck, in his "*Ph. vittata*"); three (Wagner and others); "three, sometimes with the rudiment of a fourth"; four; "four, often with the rudiment of a fifth." Supposed differences in this respect have been used as a means to discriminate subspecies or species. The facts, from the material examined by me, are these:—*H. Commersoni typicus*: four leaflets, the fourth quite small (one alcohol specimen; one skin unsuitable for this purpose); *H. C. marungensis*: four leaflets, the fourth small, but distinctly larger than in the Madagascar form (two in alc., one skin); *H. thomensis*: quite as *marungensis* (one skin; two other skins unsuitable); *H. gigas typicus*: quite as *marungensis* (four in alc., three skins, a fourth skin unsuitable); *H. g. gambiensis*: three leaflets, without any trace of a fourth (one, in alc.).—The divergent statements in literature are, I

posterior leaf of practically the same breadth as the horse-shoe, its upper border evenly convex, on the front face three vertical ridges, the lateral ridges often more or less obsolete. Thus, there are only two noteworthy points of difference between the nose-leaves of a *H. diadema* and those of a *H. Commersoni*, viz. the somewhat stronger development of the lateral leaflets in the latter type of bat (three with, almost invariably, a small fourth, instead of three with rare individual traces of a fourth in *diadema*) and the proportionately slightly smaller posterior leaf; but the shape of the posterior leaf, as well as of all the other nose-leaves, is extremely similar in both types.—A frontal sac, opening by a longitudinal fissure, is found in both sexes.

The ears are considerably modified (as compared with *diadema*): narrowed and pointed. The tail much shortened: always shorter than the lower leg (in *diadema* always much longer than the lower leg). The plagiopatagium inserted on, or a short distance above, the ankle, quite as in *diadema* *.

They are all bats of very large size, the forearm varying from 79 to 116 mm. Males seem to *average* larger than females, but practically there is no constant difference in size between the sexes †. The frontal sac is markedly shallower in females.

Their range is confined to the Ethiopian Region, on the eastern side from Madagascar and the Mozambique coast to British East Africa, on the western from Angola to Gambia. I discriminate three species (five forms).

---

believe, not difficult to explain. When the number is given too low (two, three) it may be due to an examination of *skins*, in which the true number of leaflets is often very difficult to ascertain, owing to shrinkage; when the number is given too high (four, with the rudiment of a fifth), the reason may be this: external to the fourth leaflet is almost invariably situated a small rounded gland, which by a hasty examination can easily be taken for the trace of a fifth leaflet; but similar glands are found in many other places of the upper lip.

* Some details about the insertion of the plagiopatagium on the hind leg (from alcohol specimens only):—*H. Commersoni*, in two (♀ ad.) on the ankle, in one (♂ young ad.) 2 mm. above the ankle; *H. gigas*, in one (♀ ad.) on the ankle, in one (♂ ad.) 2·5 mm., in two (♂ ad.) 5 mm., in one (♂ young ad.) 6 mm. above the ankle.—It has been suggested that the membranes in younger individuals reach the ankle, but "sich allmählig so zurückziehen, dass sie bei alten Exemplaren einen Theil des Schienbeins frei lassen" (Peters, MB. Ak. Berlin, 1871, p. 318). The above details are not in favour of that explanation.

† A few particulars in support of this statement (forearm of full-grown individuals):—*H. C. marungensis*, one male 94 mm., one female 96·5 mm.; *H. gigas*, three males 108, 110, and 115 mm., one female 108 mm.

1. *Hipposiderus Commersoni*, Geoffroy.

Diagnosis.—Skull (as compared with *H. gigas*) small: anteorbital width 9–10 mm.; upper tooth-row 11·2–12·3. Size moderate: forearm about 90–100; third metacarpal about 60–68.

Range.—Madagascar and the opposite part of the continent, northwards to British East Africa *.

1 *a*. *H. Commersoni*, Geoffroy, *typicus*.

Diagnosis †.—On an average smaller: forearm about 90 mm.; third metacarpal about 60–61.

The fourth leaflet is slightly smaller than in any other form. In one skull the upper canine and p^4 are distinctly separated, the only instance of this more primitive condition in all the skulls of the *Commersoni* type examined; in a second skull of the present form these teeth are perfectly in contact. The front face of the upper canines not very deeply furrowed.

Range.—Madagascar.

1 *b*. *H. Commersoni marungensis*, Noack.

Diagnosis ‡.—On an average larger: forearm about 94–100 mm.; third metacarpal about 66–68.

The fourth leaflet is slightly more developed than in the Madagascar form. Front face of upper canines not deeply furrowed.

Range.—From Tanganyika and the Mozambique coast northwards to British East Africa.

2. *Hipposiderus thomensis*, Bocage.

Diagnosis §.—Skull and teeth almost quite as in *H. Commersoni*. Size very small: forearm about 79–82 mm.; third metacarpal about 55–58.

* There can scarcely be any doubt that *H. Commersoni* also occurs on the western side of the Continent. Of seven examples of *Ph. Commersoni* from Angola, in the collection of the Lisbon Museum and recorded by Sr. A. F. de Seabra in Jorn. Sci. Math. &c. Lisboa, (2) vol. v. no. xx. p. 254 (Dec. 1898), four (*b*, *c*, *d*, *e*) are unquestionably *H. gigas*, whereas the others (*f*, *g*, *h*) no doubt are referable to *H. Commersoni* as defined in the present paper.

† 2 specimens, with skulls, examined: ♂ (skin), ♀ (in alc.).

‡ 3 specimens examined: 2 (in alc.), Zanzibar; 1 (skin), Tana River, British East Africa. 2 skulls (Zanzibar and Tana River).

§ 3 skins, with skulls, examined, from various places in S. Thomé.

There is scarcely any other peculiarity with this species, as compared with *H. Commersoni*, than its remarkably small size (on the coloration, see below).

Range.—San Thomé, Gulf of Guinea.

3. *Hipposiderus gigas*, Wagner.

Diagnosis.—Skull very large and heavily built: anteorbital width about 11 mm.: upper tooth-row 13·3–14·5. Size very large: forearm about 108–116; third metacarpal about 75–81.

Front face of upper canines deeply furrowed.

Range.—From Angola to Gambia; on the eastern side of the Continent as yet known from the Querimba Islands only *.

3 *a*. *H. gigas*, Wagner, *typicus*.

Diagnosis †.—Nose-leaves not enlarged: width of horseshoe and of posterior leaf about 11–12 mm.

Range.—Angola; Rio Muni (Benito River).

3 *b*. *H. gigas gambiensis*, subsp. n.

Diagnosis ‡.—Nose-leaves larger: width of horseshoe and posterior leaf about 13 mm.

In the specimen examined there are three supplementary leaflets only, no trace of a fourth.

Type.—♀ ad. (in alcohol). Gambia. Presented by the Earl of Derby. Brit. Mus. no. 42. 9. 27. 36 §.

Colour.

In the *style* of colour all bats of the *Commersoni* type are very similar to *H. diadema* ‖:—a dark brown "horseshoe" (Y-shaped) patch on the back; a more or less distinct white patch on either flank, at the insertion of the propatagium; a

* From this latter locality (the Querimba Islands) I have seen no specimens. But one of the two bats called by Prof. Peters *Phyllorhina vittata* (the male, not the female) and obtained by him in Ibo Island is undoubtedly a *H. gigas* ('Reise nach Mossambique,' Säugeth. p. 35).

† 8 specimens examined:—3 (1 alc., 2 skins), from various places in Angola; 2 (1 alc., 1 skin), Benito River; 3 (2 alc., 1 skin), without exact locality. 5 skulls: 3 Angola; 1 Benito River; 1 without details.

‡ 1 specimen, with skull, the type, examined.

§ Temminck's *Phyllorhina vittata*, from the Gold Coast ('Esquisses Zoologiques,' pp. 72–74, 1853), may belong to this form.

‖ Ann. & Mag. Nat. Hist. (7) xvi. p. 503 (Nov. 1905).

more or less distinct light longitudinal stripe bordering either side of the hinder back, along the plagiopatagium.

H. gigas.—Y-patch very pronounced, of a colour perhaps best defined as an extremely dark shade of "hair-brown"; below the tips the hairs are considerably lighter (greyish "drab"), at the extreme base very dark. The whole of the upperside in front of the Y-patch light grey; this colour confined to the tips of the hairs; below the tips the hairs are dark "drab," further down lighter, at the extreme base again dark-coloured. Longitudinal stripe on either side of hinder back well marked, of the same light grey colour as the anterior part of the upperside. A well-marked white patch at the insertion of the propatagium. Underside very light, almost whitish, or washed with greyish or yellowish; base of hairs very dark "drab" or "drab-grey."—The three skins here described are all of *young adults*, the epiphyses of the metacarpals not quite ankylosed, the teeth unworn; the whole of the coloration is strongly like that of a young *H. diadema typicus* from Java. I have but very little doubt that aged individuals will prove to be darker (as is the case in *H. diadema*).

A fourth skin (adult, unsexed; teeth slightly worn, epiphyses ankylosed) is of the russet phase. The style the same, but the whole of the pelage strongly washed with "russet"; the flank-patches (at the propatagium) indistinct.

H. Commersoni marungensis.—Practically quite like the non-russet phase of *H. gigas*. The skin is of a young adult, epiphyses ankylosed, but teeth unworn.

H. thomensis.—On the whole, both above and below, somewhat darker than *H. gigas*; flank-patches quite distinct; lateral stripes bordering hinder back somewhat obliterated. —The three skins are of individuals with slightly worn teeth and the epiphyses ankylosed, thus a little older than the light-coloured series of *H. gigas*.

H. Commersoni typicus.—Practically indistinguishable from *H. thomensis*. One skin, epiphyses ankylosed, teeth almost unworn.

As a general conclusion:—The style of colour is the same in all of the species. There is probably no essential difference in the details of the coloration between the species, provided, of course, that individuals of approximately the same age are compared. Young and young adults are lighter coloured, with the markings and stripes more strongly marked. A russet phase occurs.

Nomenclature.

Rhinolophus Commersoni; 1813 *.—Described from Commerson's drawings and hand-written notes; type locality: Fort Dauphin, Madagascar; description very incomplete, drawing bad: no lateral leaflets, no frontal sac; but there can be no doubt as to the identification.

Rhinolophus gigas; 1845 †.—The brief preliminary diagnosis (1845) must be compared with the detailed description three years later (1848). Type locality: Benguela. This, combined with the size of the skull (37 mm.), the length of the forearm (107 mm.; Wagner probably measured the radius), the shape of the ears ("hoch, schmal, länglichoval, zugespitzt"), the furrows on the canines, and the colour, settles the matter. The number of "Backenzähne" is stated to be $\frac{4}{5}$ (the small p^2 overlooked), the number of lateral leaflets 3 (probably from a skin). The frontal sac, so conspicuous in all bats of the *Commersoni* type, is not mentioned; that this is an accidental omission is proved by reference to Wagner's article on *gigas* in Schreber's 'Säugthiere' (Suppl. v. p. 651, 1855).—This is the earliest name of the largest species of the *Commersoni* type.

Phyllorhina vittata; 1852 ‡.—Peters had two distinct species of the *Commersoni* type before him when describing *Ph. vittata*. The first question therefore is which of these two species is the true type of *vittata*. The whole of the detailed description, the size as indicated in the brief "diagnosis" (p. 32), the whole series of measurements of the *first* of the two specimens (the male, pp. 35–36 §), and

* Geoffroy Saint-Hilaire, "Sur un genre de Chauve-souris, sous le nom de *Rhinolophes*," Ann. Mus. d'Hist. nat. xx. p. 263, pl. v. (head in front view).

† Joh. Andr. Wagner, "Diagnosen einiger neuen Arten von Nagern und Handflüglern," Arch. f. Naturg. xi. 1, p. 148; id. "Beschreibung einiger kleinen Säugthiere aus Syrien und Afrika," *op. cit.* xiv. 1, pp. 180–182 (1848).

‡ W. Peters, 'Naturwissenschaftliche Reise nach Mossambique,' Säugeth. pp. 32–36, pl. vi. (whole figure, head in front view, ear), pl. xiii. figs. 7–13 (skull, osteology of lower leg and foot).—(Peters refers to an earlier "Mittheilung" about *Ph. vittata* in the 'Gesellschaft naturforschender Freunde,' Aug. 21, 1849; to my knowledge no Proceedings of that Society were issued between 1839 and 1860, but reports on the meetings are said to have appeared in the 'Berliner Vossische Zeitung.')

§ Peters measures the forearm (probably the radius) of this specimen 105 mm.; taken on the life-size figure (pl. vi.) the forearm is, according to my method, very nearly 110 mm., thus precisely as in *gigas*. The tibia is stated to be 40 mm., a measurement evidently taken on the skeleton, inasmuch as it agrees exactly with the length of the tibia in the osteological figure, pl. xiii. fig. 13; on the figure pl. vi. the lower leg is at

all the figures clearly apply to a *H. gigas*. This specimen, the male, stated to have been obtained in Ibo Island, Cap Delgado group, therefore is to be regarded as the type of *vittata*, which consequently becomes a synonym of Wagner's *gigas*. The other specimen referred to by Peters (a female, measured on pp. 35–36) is a *H. C. marungensis*.—Peters's reasons for regarding his *vittata* distinct from Wagner's *gigas* are given by himself as follows (p. 36):—(1) the latter is "russbraun," *vittata* "rehbraun"; a more or less russet suffusion is, however, an individual, not a specific difference: (2) *gigas* has, according to Wagner, "nur drei Falten zu jeder Seite des Hufeisens," whereas Peters found four in his *vittata*; but specimens of *gigas* from the type locality (Benguela) examined by me have four leaflets, and Wagner's statement to the contrary is, as already mentioned, in all probability wrong, or, if correct, based on an individual aberration: (3) *gigas* was by Peters believed to differ "durch den Mangel (oder die Kleinheit?) der Stirnöffnung"; it is true that Wagner neither in 1845 nor in 1848 mentions the frontal sac in the type of *gigas*; but in 1855 (Schreber's 'Säugthiere'), three years later than Peters's 'Reise nach Mossambique,' he corrects this omission: (4) *gigas* differs "durch die nicht bis zur Ferse herabreichenden Flughäute," whereas in *vittata* "die Flughäute gehen bis auf die Fusswurzel herab"; this is a purely individual variation (*cf. antea*, p. 40, footnote *) —Thus, none of the distinguishing characters of *vittata* emphasized by Peters holds good. Another thing is that by actual comparison of the type of *vittata* (obtained in Ibo Island) with specimens of *gigas* from Benguela some slight difference on *other* points might be found; but Peters's description of the former is so detailed, and the figures, both of the external aspect and of the skull and dentition, so completely like *H. gigas*, that the difference, if any there be, must be exceedingly small indeed.

Phyllorhina Commersoni, var. *marungensis*; May 7th, 1887*. —Type locality: Qua Mpala, Marungu, W. Tanganyika. Prof.

---

least 44 mm., quite as in *gigas*. These are the only discrepancies worth mentioning between Peters's measurements of the type of *vittata* and my own of *gigas*, and they are, it will be observed, apparent only, not real.—The measurements of the skull and teeth, as taken on Peters's figures of *vittata* (pl. xiii. figs. 7–9) are like those of *gigas*.

* Th. Noack, "Beitrage zur Kenntniss der Saugethier-Fauna von Ost- und Central-Afrika," Zool. Jahrb. ii. pp. 272–275, pl. x. figs. 31–33 (head in front view; skull in lateral and upper view; all figures stated to be natural size).

Noack emphasizes only one distinctive mark: the horseshoe is "bei *Commersoni* unten gerade, bei allen 5 Ex. von var. *marungensis* unten genau wie bei *Phyll. cyclops* rundlich lanzettförmig ausgebogen." This is a very suspicious character; it is quite true that in "*Commersoni*" (*i. e.* both in the true *Commersoni* and in *gigas*) the front margin of the horseshoe is approximately "gerade"; that is to say, when we examine alcohol specimens; but in *skins* it will, almost always, be found more or less "rundlich lanzettförmig ausgebogen" (the meaning of these words is illustrated in Noack's fig. 31); there can be small doubt, therefore, that Noack was misled by the shrunk shape of the horseshoe in *dried* specimens. That this explanation is correct seems proved, almost beyond doubt, by a closer examination of Noack's description and figures:—(1) the whole set of nose-leaves (fig. 31, and measurements on p. 273) are so extraordinarily small if compared with the nose-leaves of alcohol specimens of *Commersoni* (*e. g.* width of horseshoe 8·5 mm., as against 11·7 in *Commersoni*) that, if such were really their natural aspect, *marungensis* would be a very different species; but their size is quite as in *dried skins*: (2) the number of leaflets is stated to be three (p. 272); the small fourth is most often difficult to observe in skins: (3) the exceedingly narrow and pointed ears (fig. 31) cannot have been drawn from, nor can the drawing have been controlled by comparison with, well-preserved alcohol specimens: (4) "die Flughaut reicht bis zu $\frac{2}{3}$ der Tibia" (p. 274); no bat of the *Commersoni* type known to me has, by far, $\frac{1}{3}$ of the tibia free of the plagiopatagium, but it often looks so in skins, owing to shrinkage of the narrow distal part of the membrane. Eliminating all the statements just reviewed, which, so far as I can see, must be erroneous, there remains the description and figures of the ordinary East-African representative of the *Commersoni* type, and the name *marungensis* is the earliest available for this form.

Phyllorhina Commersoni, var. *thomensis*; Sept. 1891 *.—Type locality: S. Thomé. According to Bocage, this species has three leaflets only; I find the usual small fourth in one of the skins at my disposal (two other skins unsuitable for this purpose).

Hipposiderus Commersoni mostellum; May 1st, 1904 †.—Type locality: Tana River, British East Africa. This form

* J. V. Barboza du Bocage, "Sur une variété de '*Phyllorhina Commersoni*' de l'île St. Thomé," Jorn. Sci. Math. &c. Lisboa, (2) ii. no. vi. p. 88 (see also (2) vii. no. xxvi. (1904) p. 67, where a misprint in the measurement of the ear of the female is corrected).

† Oldfield Thomas, "Three new Bats, African and Asiatic," Ann. & Mag. Nat. Hist. (7) xiii. pp. 385–386.

was separated under the supposition that Noack's *marungensis* was identical with Wagner's *gigas*. As pointed out above, there can scarcely be any doubt that *marungensis* is the ordinary East-African form, and *mostellum* thus becomes a synonym of *marungensis*.

General Remarks.

One primitive character, lost in *diadema*, has been preserved in *Commersoni* and its allies, viz. the posterior "cusp" on the upper canines. That this is a truly primitive character is shown by the fact that it is found in the overwhelming majority of *Hipposideri*, down to the most primitive species known (compare certain Insectivora).

But the bats of the *Commersoni* type are on a higher level of development than *diadema* and its allies, at least in the following points:—in the, almost invariably, complete disappearance of the interspace between the upper canine and p^4; in the much more pronounced furrows on the front face of the upper canines; in the very strong sagittal and lambdoid crests; in the wing-structure; in the almost constant presence of an additional (fourth) leaflet; in the presence of a frontal sac; in the large size. It is very probable that most of these peculiarities are closely correlated to (dependent on) each other: large size, powerful flight, more advanced wing-structure; large size, very strong teeth, more advanced stage of the dentition, more highly differentiated upper canines, much stronger cranial crests.

To sum up the probable phylogeny and interrelations of these bats:—the Ethiopian *Commersoni* and Oriental *diadema* types have had a common origin; their unknown progenitor had, as most *Hipposideri*, a posterior cusp on the upper canines; this cusp is lost in the recent modifications of the *diadema* type, but preserved in *Commersoni* and its allies; the *Commersoni* type is, apart from this particular point, on a markedly higher level of development than *diadema*.

As pointed out in the foregoing pages, three closely allied species of the *Commersoni* type can be discriminated:—one, *H. Commersoni*, essentially eastern (Madagascar; Mozambique to British East Africa), but occurring also in Angola; a second, *H. gigas*, essentially western (Angola to Gambia), but extending its range also to some part of East Africa; a third, *H. thomensis*, confined to San Thomé.

The presence of a comparatively well-differentiated species in the small island of San Thomé is in conformance with the general character of the fauna (terrestrial Mollusca, Batrachians, Reptiles, Mammals, Birds) of that island, which implies very long isolation from the continent.

Table of Measurements.

	H. armiger.				*H. turpis.*		*H. Commersoni.*				*H. thomensis.*		*H. gigas.*		
	debilis. 10 specms., 10 skulls.		f. *typica.* 16 specms., 13 skulls.		13 specms., 13 skulls.		f. *typica.* 2 specms., 2 skulls.		*marungensis.* 3 specms., 2 skulls.		3 specms., 3 skulls.		f. *typica.* 6 specms., 2 skulls.		*gambiensis.* ♀ ad. Type.
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Ears, length	28·5	...	29·2	31·8	...	...	28	...	28	...	...	...	28·7	30·8	31
,, greatest breadth	24·5	...	26	27·7	...	...	19·3	...	18	...	...	...	18·8	19	19·7
Horse-shoe, greatest breadth	8·5	...	8·8	10	...	...	11·7	...	11·5	...	...	...	11	11·8	13·2
Posterior leaf, breadth	7·2	...	7	8·8	...	...	11	...	11	...	...	...	11	12	13
Forearm	87·5	91·7	87·7	97	67·2	71·7	90	...	94	100	79	82	108	116	108
3rd metacarpal	58·7	64·8	60	65·5	46·5	49	60·3	60·8	66·5	68	55·5	57·5	76	81·2	75
4th metacarpal	58·2	63·5	59·5	66	46·8	49·6	58·8	59·7	63·2	65·8	54·5	55·5	74	79	72·5
5th metacarpal	54·5	61·5	56·8	63·2	44·8	47·1	58	59·7	63·5	65·4	52·8	56	72·8	77	70·8
Tail	50·5	...	50	61	...	...	34·7	...	35·5	...	...	...	31	39	36
Lower leg	38·2	42	38	43	29	32	36·5	38	37	40	32·7	33·2	43·5	45·8	43·5
Skull, total length	30	32·5	31·8	33·5	...	...	...	32·2	33·2	33·5	31·6	...	...	39·8	37
,, mastoid width	14·3	15·2	15	16	...	...	14·2	14·7	15·2	15·2	..	...	...	18·2	16·6
,, width of brain-case	11·7	12·2	12	12·8	10·5	11	12	12·2	12·2	12·5	11·5	12	...	14	14
,, zygomatic width	16·8	18·7	18	19·3	13·9	15	16·5	17	18	18	16·8	17	...	22·2	20
,, maxillar width	11·9	12·8	12·5	13·2	10	10·5	11·8	11·8	12	12·7	11·2	11·7	...	14·2	13·8
,, anteorbital width	9	10	9·7	10·7	7·8	8·1	9	9·5	9·5	10	9	9·2	11	11	11·2
,, across cingula of canines	8	8·8	8·8	9·5	6·7	7	8·8	9	9·8	9·8	8·7	9	...	11·6	...
Mandible	21·5	23·2	22·3	24	17·8	18·7	22	22·2	23·1	23·2	21·7	22	27·8	27·8	26·7
Upper teeth	11·6	12·5	12·2	13·1	10	10·4	11·2	11·5	11·6	12·3	11	11·2	13·8	14·5	13·3
Lower teeth	13	14	13·7	14·5	11	11·5	12·9	13	13	13·7	12·5	12·8	16	16·3	15·3

Wing-indices.

	Forearm.	3rd metac.	III.[1].	III.[2].	4th metac.	IV.[1].	IV.[2].	5th metac.	V.[1].	V.[2].
H. diadema type	1000	716	329	327	696	237	173	640	247	194
H. armiger type	1000	677	339	333	677	250	164	642	247	177
H. Commersoni type	1000	700	329	400	678	259	152	672	262	165